Rotary Handpieces are Here to Stay

BY SCOTT D. BENJAMIN, DDS

While the use of rotary instrumentation for various dental procedures reportedly dates back as far as 9,000 years ago, the basic concepts for both the pneumatic and electric handpieces were originally introduced to dentistry in the mid to late 1800s. However, it was not until 1957, when the Dentsply Company manufactured and distributed the Borden Airotor, that the "high-speed handpiece" was introduced and made commercially available to mainstream dentistry, and approximately 30 years ago the first electric dental motor and handpiece were made commercially available; around the same time, handpieces with smaller heads and illumination were being introduced that would allow improved access and visibility. It seemed that handpiece technology was evolving in several divergent directions at once, trying to solve the many separate and unique issues that each and any situation may present.

It has always been a desire of clinicians, manufacturers, and patients alike to improve the functionality and comfort of the "dental drill." Despite major developments and refinements in laser technology, micro air abrasion, and other cutting technologies, rotary instrumentation is still the mainstay of today's dental treatment modalities.

While the majority of handpieces used today are still rotary instruments, they have changed dramatically in recent years and are still undergoing constant enhancements and refinements. In addition to preparing natural dentition to accept restorative material, handpieces are being used routinely for an almost infinite range of procedures, from endodontic file manipulation to osteotomies and placement of implant fixtures. The need for the efficient removal of old restorations has become more common. Cutting through porcelain-fused-to-metal crowns and the tougher new metals, such as zirconia, are placing new demands on handpiece performance.

Each practitioner has their own considerations and priorities of what features an ideal handpiece should have, and even that varies with each situation and procedure. Nearly all practitioners desire an ergonomically well-balanced handpiece with accurate speed control that runs smoothly and free of vibration, as well as be able to withstand multiple sterilization cycles with minimal maintenance. Other almost universally desired characteristics are that they are lightweight with a small head and bright illumination that allows for good visibility and access, yet are still powerful enough with "no stall" torque and multiple spray ports. As in the past, recent changes have been primarily focused on these concerns as well as considering infection-control issues.

The power of electric handpieces has helped address some of these challenges but, initially, the increased weight, head size, and change in the tactile feel led to a slow adoption rate. New ergonomics and head designs are enabling improved balance, visibility, and access without a reduction in power. The control unit can be either an integrated component built into the treatment center or it can have a separate control box. Today, almost all of the electric handpiece manufacturers have a model that can be adapted or "retro fit" to the standard dental delivery unit, which runs from the same foot controller. The use of an external control box simply requires connecting the standard 4-hole handpiece hose adapter (which normally connects to the handpiece) and a standard electric outlet for the power supply to the box.

The precision metal-to-metal gear mechanism of the electric handpiece can create a substantial increase in power and a rigid tactile feel compared to the rubber o-ring–supported turbine of a traditional standard pneumatic handpiece. This increased cutting efficiency assists in creating smoother margins with less crazing and microfractures.

One of the newest innovations that substantially enhanced the performance of handpiece systems is a turbo-boost system that combines the power and efficiency of an electric handpiece without sacrificing the access, light weight, and familiar comfort of pneumatic handpieces. These air-driven handpiece systems deliver the best of both handpiece systems by automatically optimizing the delivery of power in response to load, offering superior performance and precision while reducing (if not eliminating) speed and torque fluctuation, bur deflection, and chattering.

This is accomplished by using a controlling mechanism with sensors that monitor the torque load that would normally cause a decrease in rotation speed of the turbine and dynamically regulates the drive air pressure to provide consistent rotation of the turbine, maximizing cutting efficiency. This enables the performance and torque of an electric handpiece with the comfort features of a pneumatic.

Another new unique feature that is now available is a handpiece with an electric generator in the handpiece itself that runs off the drive air and provides sufficient to power the embedded LED light, providing a bright light without the need for a separate electrical connection or power source.

Enhanced infection-control procedures have placed new demands on handpiece technology. Ability to withstand the thermal cycling, complications with lubrication, more demanding workflow processes, as well as the sheer number of handpieces required for a practice were just a few new challenges that had to be faced of repeated sterilization without sacrificing performance or lifespan. This has led to the development of new turbine designs and materials such as ceramics that can endure these challenges.

Despite dental rotary handpieces being one of the oldest dental technologies, it is constantly improving to rise above its past weaknesses. Rotary instrumentation has and will continue to be the mainstay of dental preparation systems and will not be replaced in the foreseeable future. With today's advanced materials and detailed procedures, the need for quality preparations and its instrumentation has never been more important. The practitioner needs to evaluate the benefits of all styles of handpieces available and make the appropriate selection for their particular needs and practice techniques.

Dental Camera Update

BY EDWARD A. MCLAREN, DDS, MDC

Clinicians weighing the pros and cons of the various dental photography options available should first consider their intended use of this important documentation and communication tool as well as their own desire and ability to use its features. Briefly, intraoral cameras are best limited to patient communication, and point-and-shoot cameras are adequate for that and taking basic images. However, the author's clear preference is for a well-chosen single lens reflex (SLR) digital camera, which offers video plus the least amount of distortion and highest image quality.

Intraoral Cameras

Intraoral cameras are small, light, and convenient, and there are some very nice chairside systems on the market today. Prices have come down and their image quality is exceptional. They enable the dentist to quickly zoom in and demonstrate problems, such as caries or cracks, or a procedure, and they don't require focusing because they usually have autofocus. They are the way to go for simply sharing information. However, in the author's opinion, their limitations outweigh these benefits for a practice with more extensive communication needs because of what they cannot do—eg, take the portraits required for smile design or other esthetic procedures—compared to digital cameras.

Digital Cameras

For this reason, the author is focusing on digital cameras for dentists with higher-end photography needs. Within this category, the options are point-and-shoot cameras, and single lens reflex (SLR) cameras. The point-and-shoot cameras range between $1,500 and $2,000; SLRs are slightly more expensive—$2,000 to $2,200, but offer many more options.

Point and Shoot

The advantages of point-and-shoot cameras, such as those offered by market leaders including Nikon, Canon, and Sony, is that they take excellent basic images, can be easily mastered, and are somewhat less expensive than SLR systems. They are appropriate for quickly capturing a picture and color. However, they have limited capabilities. Because their focal aims are fixed, some images are distorted, and there is no ability to custom position the flashes to acquire good color information and surface detail.

DSLRs

The author believes it is the SLR digital cameras that are best suited for dental use. Both Nikon and Canon offer SLR digital cameras with a flash system that allows one to customize and easily move flashes into slightly different positions, which is especially advantageous for reproducing the level of translucency in a tooth. This technology also affords direct communication with the laboratory as well as the patient in real time.

This year's models are more affordable and user-friendly than earlier models. Both the Nikon D7000, which the author uses, and the comparable Canon 60D offer a couple of the features that were in the point-and-shoot camera. Both include pre-user-defined settings, which means every camera parameter can be set in advance without the need to scroll through the settings, and they can be pre-set for more than one user. The author uses two different pre-settings—a portrait setting for close shots and a macro setting for longer shots.

This year's models also have an enormous increase in pixel number. This is generally unnecessary because the number of pixels needed for an 8.5-inch x 11-inch print or a 22-inch computer screen is under 6 million pixels. However, the pixel increase is beneficial in providing good detail when zooming in on a particular tooth in a wide view picture.

Although the most important file format—the one required by most of the academies—is RAW, there are three choices: RAW, TIFF, and JPG. Color images should be shot in RAW. This is especially important for images to be subsequently transferred to a laboratory for color interpretation.

Another improvement that facilitates communication with patients in particular is the ability to immediately share images with patients to make them aware of problems and motivate them to accept recommended treatment through wireless transfer of images from the camera to a computer or tablet using an Eye-Fi Pro X2 card (Eye-Fi, Inc., www.eye.fi), which is a secure digital (SD) memory card and wireless router in one.

Conclusion

In the author's opinion, the main objective of dental photography is communication, and the clear choice for maximizing this ability is SLR. Nearly anything that can be done with intraoral cameras can be done with SLR cameras, which have high-definition video, and, with improved ease of use, their superior image quality compared to point-and-shoot cameras should not be overlooked.